REMARKS

This communication is a full and timely response to the aforementioned non-final Office Action dated November 13, 2007. Pending claims 1-25 are re-presented for examination. Claims 1, 6, 11 and 14 are independent.

Reconsideration of the application and withdrawal of the rejections of the claims are respectfully requested in view of the following remarks.

I. Rejections Under 35 U.S.C. § 103(a)

A. Claims 1-3, 6-8, 11-16 and 18-22 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ohuchi (U.S. Patent No. 5,025,481). This rejection is respectfully traversed for the following reasons.

Conventional image processing apparatuses extract halftone-dot regions from image data and perform a smoothing operation on the extracted halftone-dot regions in order to prevent the moiré effect. To extract halftone-dot regions from image data, conventional image processing apparatuses divide the image data into blocks having a prescribed range, and determine whether the characteristics of each block correspond to those of a halftone-dot region.

However, conventional image processing apparatuses suffer from the problem of incorrectly determining characters, for example, as isolated points of a halftone-dot region. In particular, in the case of small-sized characters (e.g., characters that are 5-point or smaller), areas bordered by lines may be detected as white isolated points (see Figure 8, for example, where 12 white isolated points between the box characters are extracted). Furthermore, the dot in the letter "i" or a dot formed by the intersection of lines may be detected as a black isolated point. As a result, a region in which these characters are concentrated may be incorrectly determined to be a halftone-dot region by a conventional image processing apparatus even if it is not. Furthermore, because smoothing is carried out to such erroneously determined regions, the sharpness of the characters contained therein may become deteriorated.

Exemplary embodiments of the present invention provide an apparatus and method that minimize deterioration in output image quality by appropriately

distinguishing the attributes of image areas, particularly halftone-dot regions, and performing processing properly suited to such areas.

In particular, as depicted in Figure 1, an embodiment of the present invention[1] provides an image processing apparatus comprising a region determination unit 2, which includes a character determination unit 3 and a halftone-dot determination unit 4. As depicted in Figure 2, the halftone-dot determination unit 4 comprises a dividing unit 40 for dividing image data into large blocks of a prescribed size and further subdividing the large blocks into multiple smaller blocks. For example, as described in paragraphs [0025]-[0026] on pages 9 and 10 of the specification and illustrated in Figure 3, the dividing unit 40 divides the image data into large blocks having a size of M x N pixels, and further divides the large blocks into smaller blocks ① through ⑤ having a size of (i) x (j) pixels.

As depicted in Figure 2, the disclosed embodiment also comprises a large block isolated point calculation unit 46 for calculating the number of isolated points contained in each large block established by the dividing unit 40. In addition, as depicted in Figure 2, the disclosed embodiment also comprises a small block isolated point calculation unit 41-45 for calculating the number of isolated points contained in each small block ① through ⑤ established by the dividing unit 40.

Furthermore, the disclosed embodiment comprises a halftone-dot region determination unit 47-49 for determining whether or not a large block is a halftone-dot region based on the number of isolated points calculated by the large block isolated point calculation unit 46 and the number of the isolated points calculated by the small block isolated point calculation unit 41-45.

In another exemplary embodiment of the present invention as described in paragraph [0036] on pages 14 and 15 of the specification, for example, the large block isolated point calculation unit 46 calculates the number of isolated points contained in a large block, where the large block is composed of multiple smaller

[1] For the convenience of the Examiner and to illustrate support for the features of the present invention, references are made herein to exemplary embodiments described in the specification and the drawings. The references used herein are not intended to limit the claimed invention to the referenced embodiments.

blocks ① through ⑤ based on the small block isolated point totals calculated by the small block isolated point calculation unit 41-45.

By these configurations, the above-described exemplary embodiments of the present invention provide an image processing apparatus and method that minimize erroneous determination of divided and subdivided areas of image data and thereby appropriately determine the attributes of each area within the image data.

Independent claims 1, 6, 11 and 14 recite various features of the above-described exemplary embodiments. Claims 1 and 6 recite an exemplary apparatus, and claims 11 and 14 recite an exemplary method.

Claim 1 recites an image processing apparatus comprising a dividing unit for dividing image data into large blocks of a prescribed size and further subdividing the large blocks into multiple smaller blocks.

The apparatus of claim 1 also comprises a large block isolated point calculation unit for calculating the number of isolated points contained in each large block established by the dividing unit, and a small block isolated point calculation unit for calculating the number of isolated points contained in each small block established by the dividing unit.

In addition, the apparatus of claim 1 comprises a halftone-dot region determination unit for determining whether or not a large block is a halftone-dot region based on <u>the number of isolated points calculated by the large block isolated point calculation unit and the number of the isolated points calculated by the small block isolated point calculation unit</u>.

Claim 6 recites an image processing apparatus comprising a dividing unit for dividing image data into multiple small blocks.

The apparatus of claim 6 also comprises a small block isolated point calculation unit for calculating the number of isolated points contained in each small block established by the dividing unit. In addition, the apparatus of claim 6 comprises a large block isolated point calculation unit for calculating the number of isolated points contained in a large block of the image data, where the large block is composed of multiple smaller blocks based on the small block isolated point totals calculated by the small block isolated point calculation unit.

Furthermore, the apparatus of claim 6 comprises a halftone-dot region determination unit for determining whether or not a large block is a halftone-dot region based on the number of isolated points calculated by the large block isolated point calculation unit and the number of isolated points calculated by the small block isolated point calculation unit.

The methods of claims 11 and 14 recite steps corresponding to the constituent elements of the image processing apparatuses of claims 1 and 6, respectively.

To establish a *prima facie* case of obviousness, the applied reference(s) must disclose or suggest all the claimed features. See MPEP 2142; 706.02(j). If the applied references fail to disclose or suggest one or more of the features of a claimed invention, then the rejection is improper and must be withdrawn.

Applicants respectfully submit that Ohuchi does not disclose or suggest all the recited features of independent claims 1, 6, 11 and 14 for the following reasons.

Ohuchi discloses an apparatus and method for discriminating a dot region of an image contained in a digital input image signal. The input image signal is generated by making a raster scan of a document image in which a dot image (e.g., a photograph) and a line image (e.g., a character) coexist. An input image processing part 11 stores a quantity of the received input image signal amounting to a predetermined number of scan lines that are required to discriminate the dot region. For example, the input image signal amounting to N x 3 scan lines are stored, where N denotes a number of picture elements that determines a unit block B comprising N x N picture elements for detecting the dot region (see Column 17, lines 52-66, and Figure 3).

With reference to Figure 3, Ohuchi discloses that an extreme point detecting part 12 receives the input image signal from the input image processing part 11 and successively applies a predetermined matrix comprising M x M picture elements with respect to each picture element m included in the input image signal. Figure 4A of Ohuchi illustrates a matrix comprising 3 x 3 picture elements (m_0 to m_8), Figure 4B illustrates a matrix comprising 4 x 4 picture elements (m_0 to m_{15}), and Figure 4C illustrates a matrix comprising 5 x 5 picture elements (m_0 to m_{24}). Ohuchi discloses that the extreme point detecting part 12 detects whether or not a center picture

element m_0 of the matrix M x M is an extreme point that indicates a peak or valley of the density change based on the density relationships with surrounding picture elements m_1 through m_i ($i = M^2 - 1$) (see Column 17, line 66 to Column 18, line 14).

With reference to Figure 3, Ohuchi discloses that a dot region detecting part 13 divides the image described by the input image signal into blocks B each comprising N x N picture elements, subdivides each block B into a plurality of small regions C_i, and counts the number of extreme points indicating the valleys for each small region C_i of each block B. Figure 5 of Ohuchi illustrates a case where N=9 and the block B comprises 9 x 9 picture elements, and Figure 16 illustrates a case where i=4 and each block B is subdivided into four smaller regions C_1, C_2, C_3 and C_4. The dot region detecting part 13 discriminates whether or not a predetermined picture element within the object block B_0 (see Figure 6) belongs to the dot region, based on the relationship between a number P_0 of extreme points of the object block B_0 and numbers P_1 through P_8 of extreme points of surrounding blocks B_1 through B_8 (see Column 18, lines 15-31). In particular, with reference to steps S41-S45 illustrated in Figure 17, Ohuchi discloses that each block B is subdivided into the small regions C_1 through C_4, and a number q of extreme points is obtained for each of the small regions C_1 through C_4. Step S42 determines the number Q of small regions C_i in which q=0 for each block B with respect to both the peak and valley. Step S43 discriminates whether Q is greater than a predetermined value Q_{TH}. If $Q>Q_{TH}$, step S44 sets the number P of extreme points of the block B to P=0. On the other hand, if $Q \leq Q_{TH}$, step S45 obtains the sum of the numbers of q for the peaks and valleys, and sets the larger sum Σq as the number P of extreme points in this block B (see Column 20, lines 39-52).

With reference to Figure 3, Ohuchi discloses that a region discrimination signal output part 14 outputs a discrimination signal that indicates whether each picture element belongs to the dot region or the line region based on the result of the detection made in the dot region detecting part 13 (see Column 18, lines 32-36). As described above, the dot region detecting part 13 of Ohuchi discriminates whether or not a predetermined picture element within an object block B belongs to the dot region based on the relationship between a number P_0 of extreme points of that

object block B and numbers P_1 through P_8 of extreme points of the surrounding blocks (see Column 18, lines 15-31).

Accordingly, Ohuchi discloses that the number P_B of extreme points in regions C_1 to C_i of block B are counted (see steps S41 to S45 in Figure 17), and the number P_B of extreme points of that block B are compared with the number P_1 through P_8 of extreme points of the surrounding blocks. Thus, Ohuchi discloses that the determination of whether block B belongs to the dot region is performed based on the number of extreme points in block B against the number of extreme points of the surrounding blocks B_1 to B_8.

However, in contrast to claims 1, 6, 11 and 14, Ohuchi does not disclose or suggest that the number of extreme points of small regions C_1 to C_i of a particular block is used to determine whether that block is a half-tone dot region. On the contrary, Ohuchi discloses that the number of extreme points of the small regions C_1 to C_i of the block are used only for counting the number of extreme points of that block.

Claims 1, 6, 11 and 14 each recite that the determination of whether a large block is a half-tone dot region is based on (1) the calculated number of large block isolated points <u>and</u> (2) the calculated number of small block isolated points. In contrast to claims 1, 6, 11 and 14, Ohuchi does not disclose or suggest that the number of extreme points of the small regions C_1 to C_i of a block B are used to determine whether that block belongs in the dot region. On the contrary, Ohuchi merely discloses that the determination is made based on the number of extreme points of the block B_0 and the surrounding blocks B_1 through B_8.

Accordingly, Applicants respectfully submit that Ohuchi does not disclose or suggest a halftone-dot region determination unit for determining whether or not a large block is a halftone-dot region based on the number of isolated points calculated by the large block isolated point calculation unit <u>**and**</u> the number of isolated points calculated by the small block isolated point calculation unit, as recited in claims 1 and 6.

Similarly, Applicants respectfully submit that Ohuchi does not disclose or suggest determining whether or not the large block is a halftone-dot region based on

the calculated number of large block isolated points **and** the calculated number of small block isolated points, as recited in claims 11 and 14.

Accordingly, for at least the foregoing reasons, Applicants respectfully submit that Ohuchi does not disclose or suggest each and every recited feature of claims 1, 6, 11 and 14.

Therefore, Applicants respectfully submit that claims 1, 6, 11 and 14 are patentable over Ohuchi, since Ohuchi does not disclose or suggest all the recited features of claims 1, 6, 11 and 14.

Furthermore, in view of the distinctions discussed above, Applicants respectfully submit that one skilled in the art would not have reason or been motivated to modify Ohuchi in such a manner as to arrive at, or otherwise render obvious, the subject matter of claims 1, 6, 11 and 14.

Accordingly, Applications respectfully submit that claims 1, 6, 11 and 14, as well as claims 2-5, 7-10, 12, 13 and 15-25 which depend therefrom, are patentable over Ohuchi.

B. Dependent claims 4, 5, 9, 10, 17 and 23-25 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ohuchi (U.S. Patent No. 5,025,481) in view of Kingetsu et al. (U.S. Patent No. 6,268,935, hereinafter "Kingetsu").

As demonstrated above, Ohuchi does not disclose or suggest the halftone-dot region determination unit as recited in claims 1 and 6, and the corresponding determining steps as recited in claims 11 and 14. Similar to Ohuchi, Kingetsu also does not disclose or suggest these features of claims 1, 6, 11 and 14.

Therefore, no obvious combination of Ohuchi and Kingetsu would result in the subject matter of claims 1, 6, 11 and 14, since Ohuchi and Kingetsu, either individually or in combination, fail to disclose or suggest all the recited features of claims 1, 6, 11 and 14.

Furthermore, in view of the distinctions discussed above, Applicants respectfully submit that one skilled in the art would not have reason or been motivated to modify Ohuchi and Kingetsu in such a manner as to arrive, or otherwise render obvious, the subject matter of claims 1, 6, 11 and 14.

Accordingly, for at least the foregoing reasons, Applicants respectfully submit that claims 1, 6, 11 and 14, as well as claims 2-5, 7-10, 12, 13 and 15-25 which depend therefrom, are patentable over Ohuchi and Kingetsu.

Dependent claims 2-5, 7-10, 12, 12 and 15-25 recite further distinguishing features over Ohuchi and Kingetsu. The foregoing explanation of the patentability of independent claims 1, 6, 11 and 14 is sufficiently clear such that it is believed that separately arguing the patentability of the dependent claims is unnecessary at this time. However, Applicants reserve the right to do so if it becomes appropriate.

II. Conclusion

In view of the foregoing remarks, it is respectfully submitted that the present application is clearly in condition for allowance. Accordingly, Applicants request a favorable examination and consideration of the instant application.

If, after reviewing this Request, the Examiner believers there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

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By: /Jonathan R. Bowser/
Jonathan R. Bowser
Registration No. 54574

P.O. Box 1404
Alexandria, VA 22313-1404
703 836 6620